RM TEST REPORT

TONY BRAY gives his impressions of building and flying the MICRO-MOLD

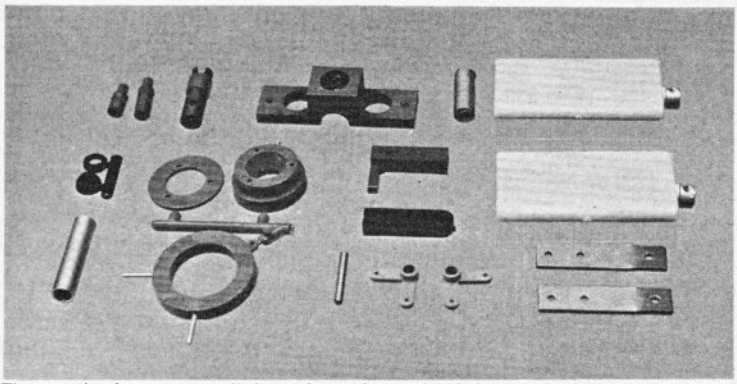
LARK

Britain's first helicopter kit gives a model that's small, light and docile to handle

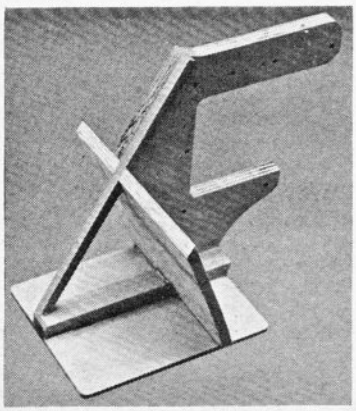
THE LARK is the first British helicopter to be available as a commercial kit, and was designed and developed by Peter Valentine, and manufactured and distributed by Micro-Mold.

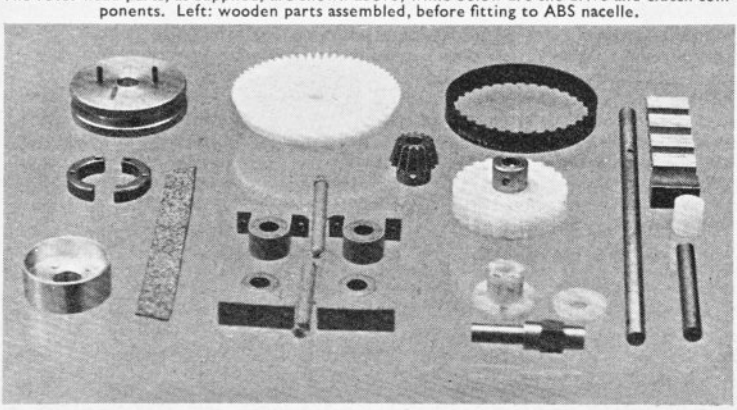
The designer has attempted to produce a model which is small, light, easy to build, docile in handling, crash-resistant and easy to repair. A good specification for a basic trainer. The kit is packed in a surprisingly small box, primarily because there is no bulky fibreglass fuselage. Furthermore, none of the mechanical components are pre-assembled; they are simply packed in polythene bags, one bag of parts for each major assembly. All mechanical components are drilled and machined as necessary, with the exception of four holes to mount the motor, which will obviously depend on the motor chosen.

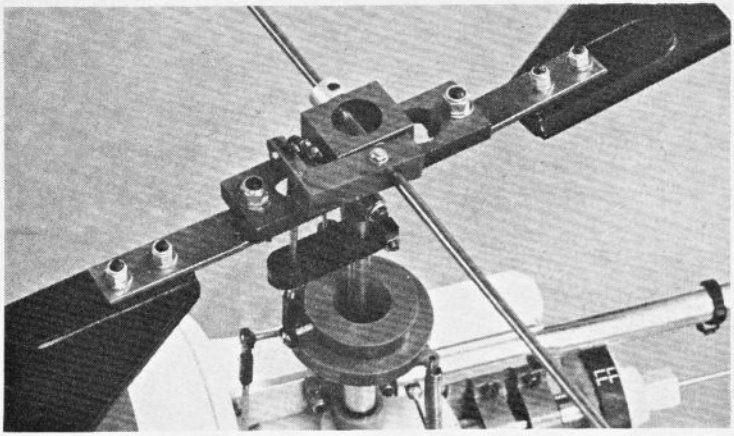
The fuselage comprises a base and canopy floor, moulded in white ABS plastic, a transparent canopy, a ply frame and a ply and balsa bulkhead, which carries an aluminium plate forming a base for the main transmission unit. The motor, which is mounted "side-winder" fashion, is fitted with a centrifugal clutch, having steel shoes and a cork liner. This drives a layshaft through a $\frac{3}{8}$in. wide toothed belt, giving a reduction of 25 : 8. The 90° drive to the main rotor is provided by relatively massive steel-to-nylon bevel gears giving a further reduction of 4 : 1. The 1 : 1 tail rotor gearbox is driven directly from the layshaft by a $\frac{1}{16}$in.



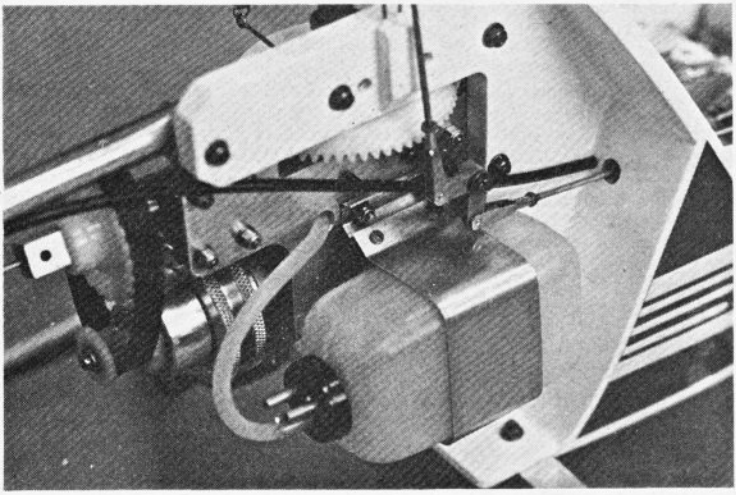
The rotor head parts, as supplied, are shown above, while below are the drive and clutch components. Left: wooden parts assembled, before fitting to ABS nacelle.



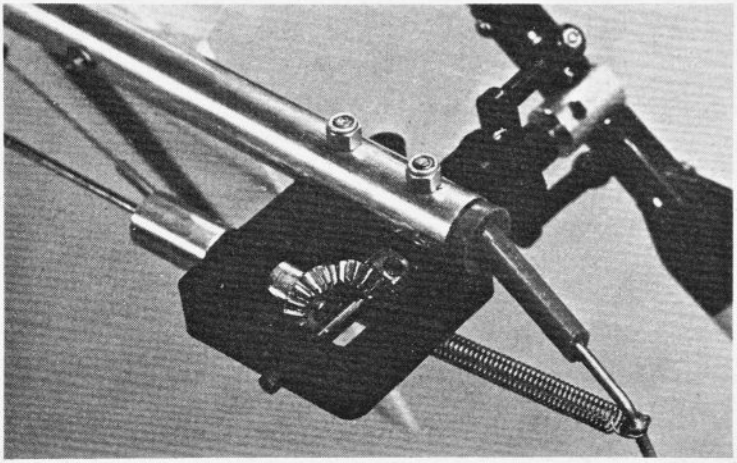




These close-ups of the main rotor head assembly and drive installation give an idea of the layout. Single bolt fixing for the main rotor blades allows them to fold back on impact.



Generous size gears are used for both main and tail rotor dives, as may be seen from the photos (above and below). The spring keeps the tail rotor pitch control wire in tension back to the servo.



diameter piano wire shaft supported by two nylon intermediate bearings.

The swashplate consists of three nylon mouldings, the fixed plate, the rotating plate and a retaining ring. The bearing between the two plates is nylon and the complete assembly tilts on a nylon hemisphere, located on the main rotor shaft. The swashplate is held down onto this half ball by a spring which also keeps both swashplate control linkages in tension back to the servos.

The main rotor head is of the Hiller type, without collective pitch adjustment, teetering or flapping hinges. Balsa and spruce are provided for the main and tail rotor blades, which have to be glued up and then shaped to a flat bottomed "Clark-Y" type section. Tube and aluminium strip are supplied for the landing skids, and this is preformed and drilled ready for assembly.

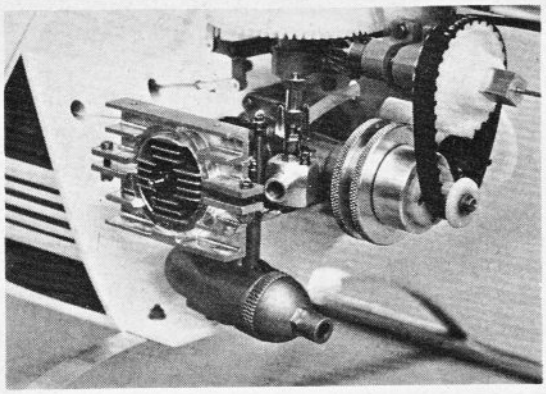
No plan is provided but the instruction book, which also includes sections on the theory of flight and flying instruction, is first class. Each stage of the construction is clearly explained and well illustrated.

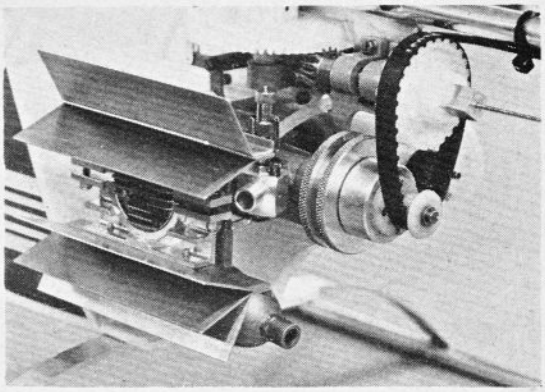
Putting it together

Some trouble was experienced in assembling the fuselage, due to dimensional errors in the pre-cut wood parts. The $\frac{3}{32}$in ply had been cut oversize, and this error was soon rectified When the vacuum formed canopy floor was trimmed, it was found to be too short. As soon as I advised Micro-Mold of the trouble they checked that there was, in fact, an error, altered the mould and posted a correct length floor the following day! (*We understand that a plan of the fuselage will now be included in the kit, and that these two errors have now been corrected—Eds.*).

The fitting of the components to the main transmission assembly presents no problems, but it is essential that the main rotor and layshafts are a free fit in their bearings. With the small engine used in this model there is no spare power to be lost in stiff bearings. They can be aligned in one plane, I found, by opening up the holes in the aluminium plate with a needle file, but stiffness may be caused because the base of the bearing block is not parallel with the bore.

The manufacturers do not, of course, recommend a particular motor but suggest it should be between .19 and .25cu.in. capacity. As it is driving through a belt there will be considerable journal load, so a ball-bearing motor is adviseable. I chose an Enya 19V ball-bearing motor for the review model, as it is





The cast heat-sink supplied (left) was augmented by addition of the 22g. aluminium plates (right).

known to be powerful with good throttling and reliable slow-running —essential requirements for a helicopter.

The tail and main rotor blades have to be balanced carefully, and I think this is really the only operation not adequately described in the instructions. After covering the tail rotor blades with plastic film, I threaded them onto a straight, short length of wire and balanced them on my propeller balancing jig, as used for my Bell-Huey *Cobra* (see R.M. for January 1973). I then added strips of plastic film to the outer end of the light blade until a perfect balance was attained.

The main rotor blades may be more difficult, unless you are fortunate enough to have wood which has been graded carefully. With the review model, the difference in weight between the blades was 9grm. It is not satisfactory to add weight only to the outer ends when there is this large weight difference, so I used more covering material on the lighter blade, resulting in its being covered with two complete thicknesses of film before final balancing.

The fuselage is large enough to accommodate four standard size servos, but good installation is easier if small ones are used, as these can be positioned so that pushrods are straight and square. I used Futaba M series servos for this reason.

I fitted the motor to the model unrun, so that running-in would also free off the main rotor and the layshaft bearings, the *Lark* being held down by a weight across the skids. During this running it was evident that a larger heat sink would be advantageous, and I made the modifications seen in the photographs, which proved very efficient.

From the initial running it was evident that an unacceptable degree of vibration was present, due to the imbalance of the main rotor, so before the first flying session this was carefully rebalanced. The vibration was still present, however, and was found to be due to the head pivot pin not being on the axis of the main rotor shaft. The hole had been incorrectly drilled in the shaft head tube. Thus, the fly-bar and paddles were correctly balanced relative to the pin—but not to the main shaft.

Some tape added to one paddle reduced the vibration to an acceptable level, so that we were able to fly it, but I do not feel this is a permanent solution.

Up and away! Tony soon had the *Lark* trimmed to hover, as may be seen from this photo. However, rather too much vibration for comfort was experienced the first time out, so another rotor balancing session was called for (see text).

Flying

The model had been set up according to the instruction book and I was able to trim it out to hover, using less than half the trim movement available on the transmitter. In a 10 knot wind, a little less than half throttle was required to hover out of ground-effect, so it would seem that the Enya .19 is sufficiently powerful. The rigid head makes the response to swashplate commands slow, and the model very docile but, once it has been mastered, I am sure that the model would be more fun to fly if fitted with either a teetering head or flapping hinges, which would give more rapid response.

Summary

The designer has undoubtedly achieved his aims. The *Lark* is small and will fit across the back seat or in the boot of the average size saloon car, with its rotor blades fitted. It is light (under 4½lb.) and is certainly docile to fly. It was quick to build and the later kits, now available, should be free of the small but annoying errors I experienced. So far, I'm pleased to say, we have not evaluated its crash-resistance, and therefore cannot comment on how easy it is to repair!

Manufacturer/Distributor: Micro-Mold, 1 & 2 Unifax, Woods Way, Goring-by-Sea, Sussex.